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AUTHOR McCutcheon, Patricia, Ed.
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ABSTRACT

Described are the materials developed by Priority One: Environment, a project of the Township of Union Public Schools, Union, New Jersey. The program was designed to develop multidisciplinary and multimedia materials for grades 1-12. This publication describes the development process, the 13 multimedia units, the evaluation process, cost effectiveness data, and inservice required. The data indicate students studying the materials do significantly better on tests related to the program than control groups, kits last about four years, consumable costs are low, and inservice training needed to utilize the program is minimal. (RH)

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PRIORITY ONE environment

POLLUTION CONTROL EDUCATION CENTER / Township of Union Public Schools, Union, New Jersey



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Pollution Control Education Center

Township of Union Public Schools

Union, New Jersey

The Center welcomes visitors who want to examine any or all of the thirteen environmental curriculum packages. Tuesday and Thursday afternoons are recommended for this purpose. Arrangements can also be made for visitors to observe an in-class use of the curriculum. Please call the Union Township Public Schools, 201/688-1200 or write to: Pollution Control Education Center, Union Township Public Schools, 2369 Morris Avenue, Union, New Jersey 07083 for further information.

Project Director	Charles Murphy
Coordinator/Editor	Patricia McCutcheon
Superintendent of Schools	Robert Fleischer
Assistant Superintendent for Curriculum & Instruction	James Caulfield

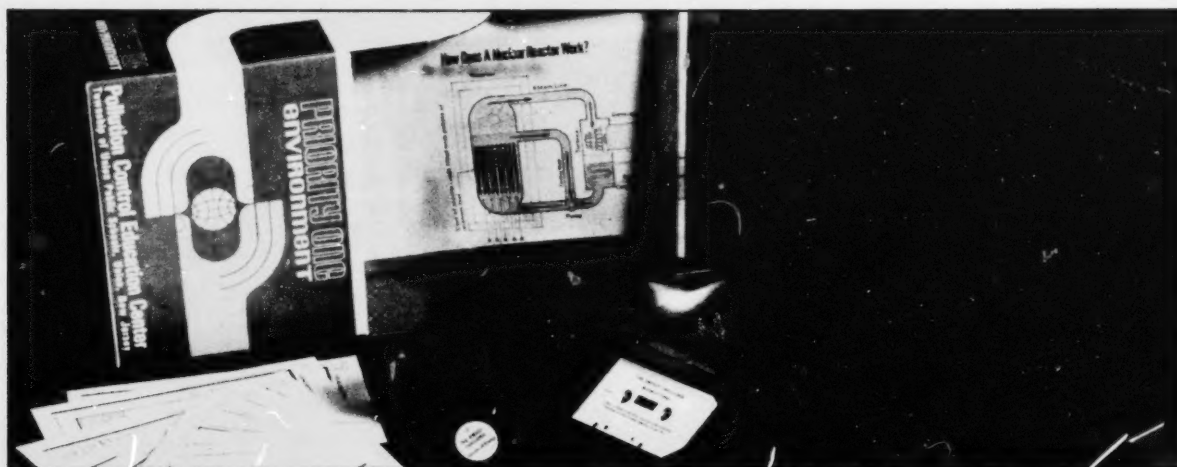
The development and dissemination work of the Pollution Control Education Center has been funded by the New Jersey Elementary and Secondary Education Act, Title III program administered by the Division of Research, Planning, and Evaluation, Department of Education, State of New Jersey. The total instructional program has been validated by the standards and guidelines of the U. S. Office of Education as successful, cost-effective, and exportable, and awarded the Educational Pacesetter Award by the President's Advisory Council for ESEA, Title III. The elementary units are available through a commercial publisher according to a contract approved by the New Jersey Commissioner of Education. Royalties are paid to the Union Township Board of Education and are available for continued curriculum development. The secondary units are available through the Union Township Board of Education.

FINAL REPORT ON THE PROJECT'S DEVELOPMENT AND EVALUATION 1970-1975

TABLE OF CONTENTS

DEVELOPMENT OF THE PROJECT	2
THE PROGRAM	4
ELEMENTARY GRADES	5
SECONDARY GRADES	6
Secondary Unit Components	8
EVALUATION	9
Design	9
Results	9
Conclusion	10
COST-EFFECTIVENESS	10
TEACHER TRAINING	10
SERVICES AVAILABLE	11

DEVELOPMENT OF THE



Priority One: Environment originated in the Township of Union Public Schools in response to environmental concerns that were expressed by students, teachers, and members of the community. A proposal was submitted to the New Jersey State Department of Education in pursuance of an ESEA Title III grant to develop a comprehensive curriculum for pollution control education. The proposal was accepted, and from 1970 to 1975 funds were awarded to Union Township to develop such a program for grades 1-12. The project became known as the Pollution Control Education Center, *Priority One: Environment*. The curriculum series which evolved from the Pollution Control Education Center is an interdisciplinary and multimedia approach to environmental education.

The program is designed to meet the needs of today's students to discover for themselves what pollution is, why it occurs, and what can be done about it. The program prepares students emotionally and intellectually to make wise decisions about the environmental alternatives they will be faced with in the future. Further, the program meets the growing demand for effective instructional materials that can easily be incorporated into any school curriculum, taking only one to two weeks of instructional time and requiring a minimum of teacher training.

THE PROCESS OF DEVELOPMENT

Project staff members came from the faculties of elementary, junior and senior high schools, and state colleges. The staff was chosen from those known to possess effective teaching skills and command of their subject matter. The staff made a commitment to develop and refine each unit in the series according to these major guidelines:

1. Each unit will use a multimedia system approach so that it will contain activity-oriented, "hands on" experiences for the students, providing both verbal and nonverbal avenues of learning.



PROJECT

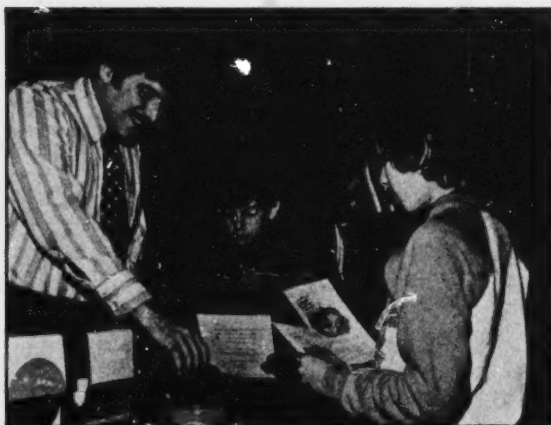
2. Each unit will be field tested and determined to be educationally sound, interesting to teach, and capable of producing high student motivation.



3. Instructional objectives will be provided for each unit, and, where appropriate, a criterion-referenced test will accompany the materials. The objectives will be designed to help the teacher coordinate the unit's components into a unified learning experience for the students.

4. Teachers' materials will be comprehensive enough to avoid the necessity of special staff training.

5. The components for each unit will be in a self-contained and instructionally complete durable kit.



6. The dynamics of each unit will not only inform students of environmental problems, but will also develop positive attitudes and behavior regarding the environment.

From the summer of 1970 to the summer of 1975, carefully chosen teams of teachers worked together to produce the thirteen units, or kits, that now comprise the total program. For example, one of the first intermediate units to be produced, Solid Waste Management, was researched and written by a team consisting of a fourth grade teacher, a sixth grade teacher, two junior high school science teachers, a high school language arts/reading teacher, and a staff artist and a staff photographer. All the units and their materials—student text, teacher's guide, activities, and experiments—were field tested during the developmental stages in appropriate grade levels. Subsequently, the materials were refined and edited and field tested again in final form. Some staff members participated in the development of several units, and others lent their expertise to the production of a single unit. Throughout the development of the *Priority One: Environment* curriculum the project had both the support of the local board of education and the cooperation of the teachers and administrators of the district. In addition to the program's use in the Union school system in grades one through twelve, more than 1,000 units of the *Priority One* program are in use throughout the United States and Canada.

THE PROGRAM

The program consists of thirteen independent multimedia units. Each unit contains all the materials needed for a class of thirty, with the exception of a few items of equipment which are readily available in the school or home. The multimedia components of the kits include student booklets, spirit master copies of worksheets and tests, activity cards, filmstrips and filmloops, audio cassettes to accompany the visuals, overhead transparencies, equipment for activities where appropriate, and, for the primary grades 1-3, games, puzzles, posters, and flannel board sets. Each kit contains a comprehensive teacher's guide which presents the rationale of the unit, the learning objectives, imaginative teaching strategies, and instructions for coordinating the multimedia components into a unified learning experience. No special teacher training is required to implement the program successfully.

The thirteen units fall into three distinct instructional groups. There are three units for the primary grades 1-3, six units for grades 4-6, and four units for the secondary grades. The content and approach of the materials at each instructional level are appropriate to the needs and interests of the students at that level. We have found that seven or eight instructional days are the optimum for a primary grade unit. The recommended time for the presentation of one of the middle grade units is one week. Most effectively, a two-week allotment should be planned for a secondary grade unit.



ELEMENTARY GRADES—

THE PRIMARY GRADE UNITS

Level I stimulates youngsters to think of themselves as crew members on a self-contained ship in space called **Spaceship Earth**. First, they create pretend adventures in outer space, using lifelike flannel board figures of astronauts and spaceships. They discuss people's survival needs both in space and on Earth—for air, food, water, fuel, and shelter. The need for companionship, rest, and cooperation is also emphasized in the discussion.

In Level II the children are made aware that the air, water, and land can no longer be taken for granted. Each child learns to identify within his own home, play, and school environment the tangible causes and effects of pollution. The student locates the sources of good and bad airborne smells in his environment.

In Level III the children are stimulated to identify themselves as part of the great **Chain of Life** on our planet. They explore the relationships linking living, nonliving, and man-made things into a single system. They look closely at food chains, natural checks and balances on population growth, and the impact of technology on the ecosystem.

THE MIDDLE GRADE UNITS

Six units are available for grades 4–6. Topics such as solid waste and sewage treatment, thermal, marine and seashore, air, and water pollution are comprehensively treated. A unit on The Great Swamp involves children in a case study of the problems of wetlands preservation, conservation, and resource management.

The audiovisuals enable pupils to observe phenomena which cannot be duplicated in the classroom. Each set of five student booklets relate new ideas to the children's own experiences. The kits' equipment, including a unique model of a cooling tower, a solar still, and a temperature inversion apparatus, enables the pupils to have dramatic classroom opportunities of involvement in solutions to environmental problems.

PRICE LIST The Pollution Control Education Center has licensed Webster/McGraw-Hill as publisher of its elementary grade program. These materials may be ordered from your local Webster/McGraw-Hill representative, directly from the publisher, or from the Pollution Control Education Center.

Level I	\$135.00	Solid Waste Management	\$ 90.00
Level II	\$111.00	The Great Swamp	\$ 85.00
Level III	\$111.00	Thermal Water Pollution	\$125.00
Air Pollution	\$125.00	Marine & Seashore Pollution	\$110.00
Water Pollution	\$125.00		

SECONDARY GRADES

THE ENERGY CHALLENGE

In this unit, the present patterns of energy consumption, the potential use of solar, nuclear, and geothermal energy, and techniques for conserving energy are explored and evaluated. Particular attention is given to the controversy concerning radioactive waste disposal and to the hope that controlled fusion reactions can be a significant energy resource.

The problems of energy supply and demand involve students in making value judgments and decisions that are dramatically current to our times.



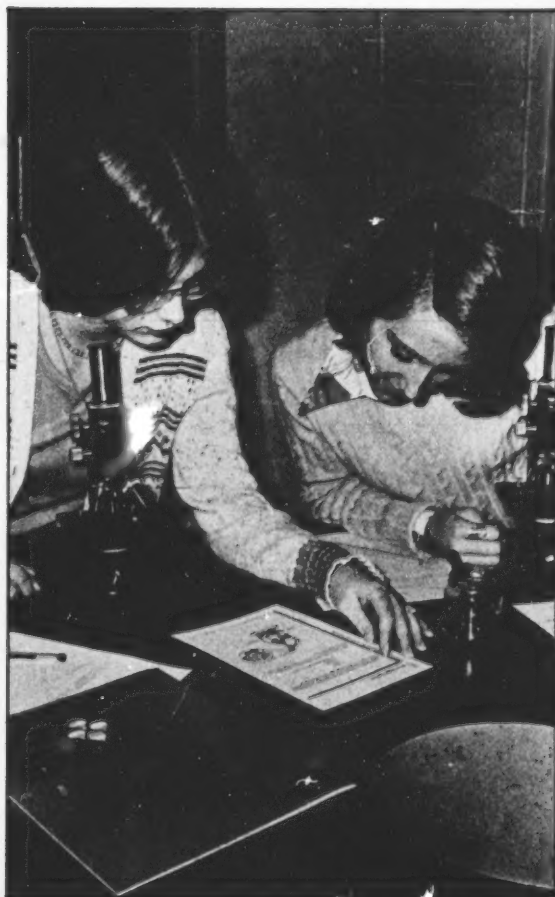
OPEN LANDS AND WILDLIFE

The unit features three comprehensive filmstrips on wildlife and equips the students with data for studying the wildlife that inhabits parks, lots, or open lands in their own vicinity. Student experiences are provided which enable urban as well as non-urban students to examine their outdoor environments. Both group and independent investigations are provided in classroom and field-tested wildlife activities.

The unit introduces ecological principles as they relate to wildlife populations, problems of endangered species, and wildlife management controversies. An evaluation of the open lands that still exist in our cities as well as in our rural and wilderness areas is made during the course of this unit. Students are helped to make decisions concerning the land use problems which both their communities and the nation face.

AIR POLLUTION AND YOUR HEALTH

This unit explores the chemistry of air pollution and its relationship to human health. Controversies concerning implementation of the Clean Air Act and the future of the automobile are also investigated by the students. The visuals vividly depict the effects on the body's systems of polluted air, and the more general threats posed to the public health. Students are directly involved in activities which dramatically demonstrate effects of air pollution and the modern technology available for air pollution control.



PROTECTING OUR WATER SUPPLIES

This two-week unit on water introduces students to the many ways water is used and abused by Americans. A case study of Lake Tahoe illustrates the damaging effects of water pollution and the political, economic, social, and technical factors involved in planning and implementing sound water management. Regional planning at the Lake Tahoe area introduces the watershed concept and the complex interaction of land and water use.

A number of activities engage the student in testing for various water pollutants and their effects. Further activities enable students to investigate water problems in their own environment and to understand current water pollution control techniques.

SECONDARY UNIT CONTENTS

THE ENERGY CHALLENGE \$60.00

Unit components are

- | | | | |
|----|---|---|---|
| 30 | 36-page Student Resource Booklets | 4 | Overhead Transparencies |
| 1 | 28-page Teacher's Guide | 2 | Filmstrips, <i>Sources of Energy, Part I and II</i> |
| 10 | Ecomasters (8 Activities and the 2-page Unit Test) | 1 | Audio Cassette (Recorded on Sides A and B) |
| 12 | Activity Cards (Supplementary and Extension Activities) | | |

PROTECTING OUR WATER SUPPLIES \$60.00

Unit components are

- | | | | |
|----|---|---|---|
| 30 | 24-page Student Resource Booklets | 4 | Overhead Transparencies |
| 1 | 24-page Teacher's Guide | 3 | Blank Overhead Transparencies |
| 12 | Ecomasters (9 Activities and the 2-page Unit Test) | 2 | Filmstrips, <i>Water—The Abused Servant of Man</i> and <i>Lake Tahoe—Then and Now</i> |
| 8 | Activity Cards (Supplementary and Extension Activities) | 1 | Audio Cassette (Recorded on Sides A and B) |

AIR POLLUTION AND YOUR HEALTH \$60.00

Unit components are

- | | | | |
|----|---|---|--|
| 30 | 24-page Student Resource Booklets | 4 | Overhead Transparencies |
| 1 | 24-page Teacher's Guide | 2 | Filmstrips, <i>A Story of Air Pollution</i> and <i>The Impact of Air Pollution</i> |
| 10 | Ecomasters (8 Activities and the 20-page Unit Test) | 1 | Audio Cassette (Recorded on Sides A and B) |
| 8 | Activity Cards (Supplementary and Extension Activities) | | |

OPEN LANDS AND WILDLIFE \$60.00

Unit components are

- | | | | |
|----|---|---|--|
| 30 | 36-page Student Resource Booklets | 4 | Overhead Transparencies |
| 1 | 32-page Teacher's Guide | 3 | Filmstrips, <i>Why Wildlife? Don't Fence Me In—A Story of Shrinking Spaces</i> , and <i>How You Can Help</i> |
| 12 | Ecomasters (6 Activities and the 2-page Unit Test) | 1 | Audio Cassette (Recorded on Sides A and B) |
| 10 | Activity Cards (Supplementary and Extension Activities) | | |

These units may be ordered from the Pollution Control Education Center, Union Township Board of Education, 2369 Morris Avenue, Union, New Jersey 07083.

PRICES FOR ADDITIONAL MATERIALS

Teacher's Guide (each)	\$ 5.50	Filmstrips & Audio Cassette (per unit)	\$22.50
Student Booklets (sets of 10)	\$10.00	Unit Ecomasters (per set)	\$ 2.70

EVALUATION

DESIGN

A pretest/post-test design was used in the evaluation of all the units of the *Priority One: Environment* program. The tests were criterion-referenced tests developed by the P.C.E.C. staff and were related closely to the instructional objectives upon which the units were based. A minimum of reading was called for in the test design for Grade 1; fill-in responses were provided for the test for Grade 2; and a 15 item multiple-choice test was designed for Grades 3 through 6. A 20 item multiple-choice test was used for each of the four secondary units of the series.

Control groups were used in the evaluation of all *Priority One* units. In the elementary grade field testing, the experimental group used *Priority One* materials, one control group received instruction from an environmental education unit prepared by a commercial publisher, and a second control group received no instruction in environmental education between their pre and post tests. The groups ranged in size from approximately 40 to over 90 pupils.

Stratified random sampling procedures were employed to select participants. The tests were checked for validity and reliability. Experts in the subject matter areas reviewed the tests for content validity. The consistency of performance of experimental and control groups was monitored also as a further check on test validity.

To check for reliability, the Kuder-Richardson formula 20 (KR20) procedure was used. Analysis of covariance and post hoc comparisons (using Fryer's method or Scheffe's test) were employed to determine the significance of the differences of the pretest/post-test means.

RESULTS

Evidence of the validity of the elementary units' pre and post tests is seen in the consistency of the position of the control group receiving environmental education instruction from materials other than those of *Priority One*. This group regularly scored about equi-distant between the *Priority One*-taught experimental group and the group that received no instruction in environmental education. For all units the tests were quite sensitive to the knowledge level of the students on topics related to environmental control.

Evidence of reliability gained from the KR20 procedure revealed for the elementary units coefficients ranging from .33 to .90. These are quite acceptable considering the brevity of the tests. In the four secondary grade level units the KR20 formula yielded a reliability coefficient of .90 for **The Energy Challenge**, a coefficient of .95 for **Protecting Our Water Supplies**, a coefficient of .73 for **Open Lands and Wildlife**, and a coefficient of .80 for **Air Pollution and Your Health**.

The analyses of covariance indicated that for all the primary units the adjusted post-test means of the *Priority One* groups were significantly higher than those of both control groups. For the upper elementary units it was found again that all the *Priority One* groups scored significantly higher than did the group receiving no instruction. The *Priority One* group was also significantly better than the alternate instruction group on five of the six comparisons made. For the four secondary units it was again found that the *Priority One* groups scored significantly higher (at the .01 level) on their post tests than did the control groups.

The project was demonstrably effective. Students using *Priority One* learn basic ideas about the causes of and solutions for environmental problems. Students using *Priority One* materials learn a significantly greater amount than students receiving instruction in the same subject matter, but not using the materials. In addition to the test results, consistent reactions from the teachers and the students using *Priority One* materials indicate that the pupils learn new concepts which they did not know before and which are not now part of their out-of-school experiences. That the students who participated in the project's class experience achieve the instructional objectives of the program is further borne out in non-test responses and student actions which indicate a higher commitment to positive environmental attitudes.

COST-EFFECTIVENESS

Careful planning in developing the materials and in field-test revisions has resulted in a program design which is remarkably cost-effective. The operational costs of the *Priority One: Environment* program are very modest—they average twenty (20) cents per pupil for the secondary units and thirty-five (35) cents per pupil for the elementary program.

Both in the developing district, Union Township, and in adopting districts, it has been found very practical to plan for a kit to be used by four or more classes a year—thus serving more than one hundred pupils. The kit materials are durable and should last at least four years. Most districts possess the audiovisual equipment needed to use the program's visuals. Consumable materials have been kept to a minimum. The cost of replacing the spirit duplicator masters and locally obtainable materials runs between \$1.00 and \$8.00 a year, depending on the unit. These costs have already been computed in the per pupil figures quoted above.

TEACHER TRAINING

Teacher training is not a prerequisite to successful adoption. However, districts that may wish to provide a teacher workshop can contact the project office or the National Diffusion Network office of their state's Department of Education for further help in planning a workshop. Districts providing in-service training have found that a half-day program is successful for either the elementary or the secondary *Priority One* program. If the adoption covers both the elementary and the secondary grades, then it is most efficient to plan a morning presentation for one group and an afternoon presentation for the other.

COMMITMENT LEVEL SERVICES AVAILABLE TO DISTRICTS THAT WISH FURTHER ORIENTATION IN THE PROGRAM'S USE

1. Consultation is available to districts that wish to adopt one or more of the secondary units.
2. A one-day workshop on the implementation of one or more of the secondary units is available for districts that agree to evaluate student performance in the program and report these data to the Center. A suggested agenda follows:
 - a. Goals of program
 - b. Instructional Objectives and teacher's guides
 - c. Planning strategies
 - d. Use of students' materials
 - e. Integration of visuals
 - f. Presentation of demonstrations and setting up of experiments
 - g. Discussion techniques
 - h. Use of tests
 - i. Evaluating results
 - j. Reporting program outcomes
3. Follow-up consultation will be provided to districts implementing the program. The sites of the training and consultation will be arranged on an individual basis for each consumer district.
4. The project staff will analyze student test data from adopter districts and provide the district with three copies of the analysis.

To be eligible to receive these commitment level services of the Pollution Control Education staff, the consumer district staff must agree to

1. Use one or more of the secondary units in the consumer district.
2. Select a liason person in the consumer district who will be responsible for scheduling the training session, contacting the Center's staff for follow-up consultation, scheduling the kits' use in the local district, conducting an evaluation of the program's use, and providing the evaluation data to the Center's staff.
3. Cooperate with the staff of the Pollution Control Education Center and the New Jersey Department of Education in evaluating the use of one or more of the secondary units by completing an implementation questionnaire and administering the pre and post tests provided in the kits to experimental and control groups of students. The selection of these groups and the timing of the testing will be agreed upon in cooperation with the Center's staff. Test data will be returned to the Center's staff for analysis.

Districts who wish these commitment level services are asked to contact the Center.

